INTRODUCTION

Purpose and Objective

The Colorado River Basin Salinity Control Act firmly establishes that the purpose of salinity control activities is to reduce the salt load carried by the Colorado River. Two co-equal national objectives form the basis for planning salinity control activities. These are to protect and enhance national economic development and to protect and enhance environmental quality. This project is formulated to achieve these objectives.

The project analyzes salt loading from off-farm irrigation delivery systems and from on-farm irrigation distribution and application systems. These activities are directed toward quantifying answers to four basic questions:

1. What is the magnitude of on-farm improvement needs? On-farm irrigation improvements include ditch lining or pipelines with appropriate water control structures, on-farm water measuring devices, and irrigation water management.

2. What is the magnitude of salt loading from off-farm irrigation delivery systems? How would treatment via pipelines and polyacrylamide impact salt loading from this source?

3. What are the estimated installation costs, the level of funding required for program implementation, and the magnitude of benefits to be derived from implementing needed improvements? Benefits will accrue locally as well as nationally and internationally. Local benefits include reduced costs of production, improved irrigation systems and increased crop yields. National and international benefits accrue through improved water quality for downstream users.

4. What will be the effect on salinity contributions to the Colorado River? Salt loading will be reduced through decreasing deep percolation by increasing irrigation efficiencies and eliminating ditch seepage.

Scope of Study

The scope of the study was limited to inventorying and analyzing current irrigation systems and management practices used in 26 irrigation ditches. These 26 ditch systems supply irrigation water to approximately 10,800 acres through about 100 miles of earthen ditches.

Each of the 26 systems was analyzed separately to determine what type of improvements would be the most economically feasible. The analysis was done only to determine the average cost effectiveness of the project.

An alternative was formulated which combined improvement of on-farm and off-farm irrigation delivery and application systems.

On-farm irrigation improvements studied included conversion to sprinkler systems or minor surface system improvements and improvements to the delivery ditches.

Desalinization plants are being used in some locations in California and Florida to remove salts from sea water. The large scale desalinization plant built on the Colorado River by the Bureau of Reclamation in Yuma, Arizona has operated on an experimental basis due to the high operating costs. Where analyzed, desalinization plants have typically been a more expensive method of reducing salinity than the on-farm treatments evaluated in this report. Using desalinization plants will not prevent salts from entering the river, but will remove them at some point downstream. The salts still affect the quality of the water between their entry point and removal point, plus they create a disposal cost and problem wherever they are removed. The USDA has no authority to evaluate or construct large scale desalinization facilities, and thus this option was not considered a viable alternative in the context of this study and was not included as a part of the plan and report.

Description of Plan Formulation

Salt loading occurring from irrigation sources in the valley is caused by seepage and deep percolation of irrigation water into and through salt laden soils and shale layers. Practices that can reduce seepage and deep percolation and the associated salt loading are summarized in Table 3 and form the basis for plan formulation.

Table 3: Source of On-farm Salt Loading

SOURCE	APPLICABLE PRACTICES	
	MANAGEMENT	STRUCTURAL
Ditch Seepage	Adjust the number and frequency of irrigation water delivery.	Install pipelines and appurtenant structures, measuring devices, and utilize polyacrylamide
Tailwater Runoff	Adjust the flow rate, the time of set, the number and frequency of irrigations	Install lined and unlined tailwater collection ditches or lined ponds.
Deep percolation Non-uniform Application of irrigation water	Adjust the number of irrigations, the time of irrigations, the time of set, and flow rate.	Install water measuring devices, land smoothing, and automated timing devices. Change to sprinkler irrigation.
Inefficient layout of fields and irrigation systems.	Combine fields.	Relocate pipelines and change to sprinkler irrigation.

The undulating topography, ranging between 2 to 12 percent slopes, essentially precludes attaining uniform application of irrigation water using surface application methods in much of the Mancos Valley. Without uniformity of application, a primary element of irrigation water management is lacking. Sprinkler irrigation systems are better suited to the uneven topography to achieve a more uniform distribution and other aspects of irrigation water management needed for salinity control. Pipelines carrying water will essentially eliminate seepage from a portion of the existing water delivery system. Plan formulation focuses on delivery system improvements and on-farm application improvements. The on-farm irrigation system improvements will help to facilitate and enhance irrigation water management. Irrigation water management is a key non-structural component of salinity control.